REMARKS

Applicants thank the Examiner for the thorough consideration given the present application. Claims 37-44 remain under consideration in this application. Claims 45-48 have been withdrawn from consideration. The Examiner is respectfully requested to reconsider his rejections in view of the amendments and remarks as set forth below.

Amendment

Applicants request that the present amendment be entered and be given full consideration. Each of the independent claims has been amended to include limitations that have previously been argued and which the Examiner has indicated were not present in the claim.

Finality of the Rejection

Applicants request that the finality of the current rejection be removed. It is noted that this is a first action after the filing of an RCE and includes new claims. Applicants have not previously received a full action on the present claims which have been submitted in response to the decision by the Board of Appeals. Applicants request that the finality of the present rejection be removed and that the present amendment be given full consideration.

Restriction

It is noted that the Examiner has withdrawn claims 45-48 as being drawn to a non-elected invention. Applicants submit that these claims should also be considered along with claims 37-44. Applicants submit that the withdrawn claims are similar to the claims under consideration and that no undue difficulty is involved for the Examiner to consider all the claims in one action. Moreover, reinstatement of these claims is respectfully requested.

Rejections under 35 U.S.C. 103

Claims 37-43 stand rejected under 35 U.S.C. 103 as being obvious over Nishizawa et al. (US Patent 5,693,139) in view of Edmond et al (US Patent 5,739,554). Claim 44 stands rejected under 35 U.S.C. 103 as being obvious over Nishizawa et al in view of Edmond et al and further in view of Manabe et al (US Patent 6,472,690). These rejections are respectfully traversed.

The Examiner states that Nishizawa, et al. shows a method of growing doped semiconductor monolayers including supplying raw material gases of Ga for a predetermined time, the chambers evacuated and As is supplied and the cycle repeated. The reference also discloses a p-type layer formed by introducing impurity gases and Ga simultaneously but alternately with a As source. The reference also discloses an n-type layer doping with Se or S and the impurity gases introduced cyclically with the Ga and As gas. The Examiner admits that Nishizawa et al. does not disclose the given time for supplying each of the impurity raw materials are close to each other.

The Examiner relies on Edmond et al. to teach a Ga n layer co-doping with both a Group II acceptor and Group IV donor. The Examiner feels that this suggests applicant's time for supplying each of the impurity raw materials being close to each other. Applicants submit that claim 37 is not obvious over these two references. Claim 37 has now been amended to recite that an acceptor level of the semiconductor having a deep band gap become shallow since the complex probability of three atoms increases due to the tendency that the atoms move around the surface of the crystal. A molecular state acceptor which is obtained by associating two acceptors and a donor is produced. Thus, claim 37 now discusses in more detail the result of the doping based on the easy movement of the atoms around the surface and the molecular state acceptor produced by associating two acceptors and a donor. Applicants submit that these features are not obvious over the combination of Nishizawa, et al. and Edmond, et al.

The present invention is based on a methodology for realizing a co-doping method. Such a method has been theoretically suggested previously. The co-doping is possible to provide a shallow acceptor level of a wide band semiconductor having a deep band gap that would create a

good luminescent element which has high efficiency and short wavelength, since the co-doping produces an acceptor which is obtained by associating two acceptors and a donor.

Nishizawa, et al only shows a doping of one type of atom. If the atoms dope the a-part of a compound semiconductor which is a composition of a-b, for example, the compound semiconductor turns into an n-type semiconductor. On the contrary, if the atoms dope the b part of the compound semiconductor, the compound semiconductor turns into a p-type semiconductor. Therefore, Nishizawa et al is only able to control the valence electrons. The Examiner has also cited the Edmond invention as being able to control by doping two types of atoms into a crystal at the same time and that this is a type of co-doping. Applicants submit that neither of the references nor their combination anticipate or obviate the present invention. Nishizawa is similar to the present invention in the manner of alternate introduction of materials, but Nishizawa et al. describes that the doping method uses only one type of atom and the semiconductor turns either n-type or p-type depending on whether the atom is doped into the a part of the compound semiconductor or the b part of the compound semiconductor. Thus, Nishizawa et al does not teach the co-doping of a semiconductor.

If two atoms are used, after the donor is doped, As or Ga are doped into the compound semiconductor immediately. As a result, the complex of the three atoms can not be created because the dopings move around the surface of the crystal.

Edmond discloses entering two types of atoms into a crystal at the same time as dopings. However, since the dopings can not move around easily in the crystal, most of the dopings make complexes and do not have the possibility that the dopants form complexes having three atoms. In addition, Nishizawa et al does not teach the point that atoms tend to move around and easily create complexes of three atoms on the surface of the crystal in a method including alternate introduction. Applicants have used this method to realize acceptor concentrations of $1x10^{19}/cm^3$ in the crystal of GaN which has never been obtained before. This has been accomplished by increasing the complex probability of three atoms based on the tendency of atoms to easily move around the surface of the crystal. As a result, the present invention is completely different from

the teachings of Nishizawa et al and Edmond et al or their combination. The present invention produces a methodology which allows codoping which although suggested theoretically has never been produced. Applicants submit that claim 37 is not obvious over this combination of references.

Claims 38-44 depend from claim 37 and as such as also considered to be allowable. In addition, each of these claims recite other features which make them additionally allowable.

Independent claims 45 and 47 have been withdrawn from consideration. However, these claims have been amended to include the same new paragraph which was added to claim 37. Applicants admit that these claims are likewise allowable for similar reasons as presented above.

Conclusion

In view of the above remarks, it is believed that the claims clearly distinguish over the patents relied on by the Examiner, either alone or in combination. In view of this, reconsideration of the rejection and allowance of all the claims are respectfully requested.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert F. Gnuse, Reg. No. 27,295 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

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